

REMARKS

The Office Action mailed May 27, 2005 has been carefully reviewed and the foregoing amendments and the following remarks are made in response thereto.

Claims 1-8 and 10-19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,791,321 to Kondoh in view of Japanese Patent Application Publication No. 2001-012262 (hereinafter, “JP ‘262”). Applicant gratefully acknowledges the Office Action’s indication that claims 9 and 20 would be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims.

By this amendment, claims 1-4, 9, 11-15 and 20 have been amended for clarity to clearly specify that the term “an opening period” refers to *an opening time period*. The opening time period is defined between an opening time and a closing time. Support for this amendment can at least be found on page 9, line 5 of the present specification. Claim 10 has been amended to improve its readability. Claims 5-8, and 16-19 remain unchanged in the application.

This amendment changes, adds, and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier. Thus, claims 1-20 are presently pending in this application for consideration.

Applicant respectfully submits that each of the pending claims is patentably distinguishable over the cited references as required by § 103. Applicant further submits that neither Kondoh nor JP ‘262, whether considered alone or in combination, discloses Applicant’s claimed apparatus and method for varying an injection quantity per unit time of the fuel injection valve based on a detected *opening time period of an intake valve*. Pending independent claim 1 includes an opening time period detector detecting an opening time period of the intake valve. Independent claims 11 and 12 recite a similar feature in the context of an apparatus claim incorporating means-plus-function language and a method claim, respectively. By contrast, the cited references fail to teach or suggest the opening time

period detector detecting an opening time period of the intake valve. Accordingly, each of the claims is patentably distinguishable over the cited references. This distinction will be further described below.

THE CLAIMS DISTINGUISH OVER THE CITED REFERENCES

The apparatus of claims 1 and 11, and the method of claim 12, allow for having fuel injection performed within an opening time period of an intake valve, and thus, it is possible to atomize all of the fuel due to an intake air flow within an intake stroke. Moreover, since the fuel injection is synchronized with the opening time period of the intake valve and the fuel is continuously sucked into a cylinder within the intake stroke, a uniform air-fuel mixture can be formed in the cylinder, reducing fuel consumption and emissions (Specification, page 16, lines 21-30).

Kondoh is directed to a fuel supplying apparatus for an internal combustion engine designed to handle the situation where fuel vapors are formed in a fuel tank and purged to the engine. In Kondoh, the opening time of the fuel injection valve and an amount of discharge of the fuel pump are adjusted to reduce the amount of fuel injected by the fuel injection valve. The Examiner's comments indicate an awareness that Kondoh does not disclose the claimed opening time period detector. Because of that shortcoming, the Examiner has relied upon the disclosure of JP '262. However, this reliance is misplaced since the system in JP '262 is distinctly different from that suggested by either Kondoh or the present claims.

JP '262 discloses a variable valve system of an internal combustion engine. According to JP '262, the necessary amount of control current (determined by the current control operating means B5) is corrected on the basis of a reaction torque equivalent current value. This corrected necessary amount of control current makes a target control shaft operating angle (determined by the target operating angle operating means B3) agree with a control shaft actual operating angle (determined by the angle detecting means B4). The driving current to a DC servo motor is determined and output to a PWM output determining means (B8). A reactive torque might occur due to reactive forces generated by, for example, valve springs (33).

Thus, even if JP '262 were directed to subject matter combinable with Kondoh, JP '262 still fails to disclose the claimed feature of the opening time period detector. To the contrary, JP '262 appears to be expressly concerned with controlling the amount of current supplied to an electro-magnetic actuator for the purpose of inhibiting the fluctuation of an operating angle.

Moreover, neither Kondoh nor JP '262 suggest that the injection quantity per unit time should be varied according to the opening time period of an intake valve. Thus Kondoh and JP '262 do suggest varying an injection quantity per unit time of the fuel injection valve based on a detected opening time period of an intake valve as in claims 1, 11 and 12.

In conclusion, it is respectfully submitted that at least one of the features of the present invention, namely the opening time period detector detecting an opening time period of the intake valve is not disclosed in any of the references cited by the Examiner and is not suggested by any of the references either taken alone or in combination. Applicant respectfully submits that each of the pending independent claims 1, 11 and 12 is patentably distinguishable over Kondoh in view of JP '262 and thus, allowable. Moreover, since independent claims 1, 11 and 12 are allowable, claims 2-10 and 13-20 are also allowable by virtue of their direct or indirect dependence from allowable independent claims 1, 11 and 12 and for containing other patentable features. Further remarks regarding the asserted relationship between any of the claims and the cited references is not necessary in view of their allowability. Applicant's silence as to the Office Action's comments is not indicative of being in acquiescence to the stated grounds of rejection.

Accordingly, this application is in condition for allowance and Applicant respectfully requests early notice to that effect.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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